

LLNL Environmental Restoration Division (ERD)
Standard Operating Procedure (SOP)

ERD SOP 3.1: Water-Level Measurements—Revision: 6



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1.0 PURPOSE

The purpose of this SOP is to determine the depth to water from a standard point of measurement (POM) in an open borehole, cased borehole, monitor well, or piezometer.

2.0 APPLICABILITY

This SOP procedure is applicable for the collection of ground water elevation data for use during ground water sampling, as well as for use in constructing graphical displays (i.e., potentiometric surface maps and monitor well hydrographs).

3.0 REFERENCES

- 3.1 U.S. EPA (1986), *RCRA Ground water Monitoring Technical Enforcement Guidance Document*, Washington, D.C.
- 3.2 U.S. EPA (1992), *RCRA Ground Water Monitoring: Draft Technical Guidance*, Washington, D.C. (EPA/530-R-93-001).

4.0 DEFINITIONS

See SOP Glossary.

Procedure No. ERD SOP-3.1	Revision Number 6	Page 2 of 9
------------------------------	----------------------	-------------

5.0 RESPONSIBILITIES

5.1 Division Leader

The Division Leader's responsibility is to ensure that all activities performed by ERD at the Livermore Site and Site 300 are performed safely, comply with all pertinent regulations and procedures, and provide the necessary equipment and resources to accomplish the tasks described in this procedure.

5.2 Field Personnel

While at the well site, any needed repairs should be recorded on the Well Maintenance form and submitted to the Field Operations Manager with a copy to the Sampling Coordinator. The field personnel are responsible for properly performing water-level measurements in compliance with all applicable regulations and procedures and ensuring that the resulting data accurately represents the true hydrogeologic conditions.

5.3 Subproject Leader (SL)

The SL determines which ground water installations require ground water elevation monitoring, and sets the schedule for the collection of this data.

5.4 Sampling Coordinator (SC)

The SC's responsibility is to verify the accuracy of the water-level measurement(s) and compare the new data to historical data and decide if it is consistent or suspect.

5.5 Data Management Team (DMT)

The DMT is responsible for the generation of all applicable Water-Level Measurement Field Sheets used to record the water level data. Upon completion of the water level monitoring, the DMT is also responsible for entering the data into the database.

6.0 PROCEDURE

6.1 Preparation

- 6.1.1 Review and perform preparation activities per SOP 4.1, "General Instructions for Field Personnel".
- 6.1.2 If the water-level data are being collected for the entire site, the Water-Level Measurement Field Sheet, obtained from the DMT, should be used (Attachment A). If the data are being collected as part of a hydraulic test, consult SOP 3.2, "Pressure Transducer Calibration"; 3.3, "Hydraulic Testing (Slug/Bail)"; or 3.4, "Hydraulic Testing (Pumping)," as appropriate. If the data are being collected during ground water sampling, SOP 2.1, "Pre-sample Purging of Wells" or 2.7, "Pre-sample Purging and Sampling of Low-yielding Monitor Wells" should be followed, as appropriate.
- 6.1.3 Obtain a Water-Level Measurement Field Sheet that includes the previous month's water levels from the SC or the DMT.

Procedure No. ERD SOP-3.1	Revision Number 6	Page 3 of 9
------------------------------	----------------------	-------------

- 6.1.4 The device used to measure water levels should attain an accuracy of 0.01ft. A steel tape or an electric sounder can be used to measure water levels, but this SOP concerns only the use of an electric sounder.
- 6.1.5 For Site 300, water-level indicators can be acquired at Building 833. When practical, the same portable water-level measurement device should be used for all measurements. However, Site 300 is divided into two areas with respect to water levels. In the northern portion of the site, also referred to as the East/West Firing Area (EWFA), tritium is the prevailing contaminant. The southern portion of the site is predominately contaminated with volatile organic compounds (VOCs). In order to prevent cross contamination between monitor wells, the water-level indicators must be decontaminated according to SOP 4.5, "General Equipment Decontamination." If an indicator is dedicated to a particular section of the site, or a particular well, it will be marked accordingly.
- 6.1.6 For the Livermore Site, the same water-level device may be used site wide, except in areas of heavy gasoline contamination.
- 6.1.7 Obtain the equipment on the Equipment Checklist (Attachment B).
- 6.1.8 Make sure water-level measuring equipment is in good operating condition.
- 6.1.9 Whenever possible, start at those wells that are the least contaminated and work towards more contaminated areas as indicated by the SC.
- 6.1.10 Clean all equipment per SOP 4.5 before use.

6.2 Water-Level Measurement Procedure

- 6.2.1 Unlock and open the protective casing. Remove the well casing cap.
- 6.2.2 Make sure there is a Well Entry Logbook inside the protective casing. Replace the old or unusable logbooks and give to the DMT for archival. Write the date, purpose of well entry, and initials in the logbook.
- 6.2.3 Use the top of the protective casing (stove pipe or Christy Box) as the measuring reference point. This is the POM to be used when obtaining water-level measurements. Any deviation from this measuring point must be documented on the Water-Level Measurement Field Sheet (Attachment A) and reported to DMT and the SC.
- 6.2.4 Measure the distance from the water surface to the POM by placing a steel indicator reference bar (or something comparatively straight and rigid) over the top of the protective casing or Christy Box then, lower an electronic water-level indicator or equivalent (i.e., steel tape) into the sounding port as marked. Insertion into the pump discharge line (usually of the same diameter) will give a false reading. Using the electronic water-level indicator, a light (usually red) will shine on the reel of the water-level indicator, and an audible buzz will sound when water is encountered. Slowly move the line up and down along the side of the reference bar until the exact point at which the buzz is heard is located. Using the bottom of the reference bar as the measuring point, obtain the depth-to-water measurement by referencing the markings on the water-level indicator line to the buzzing tone red indicator light. The water level indicator may then be removed and cleaned (per SOP 4.5).

Procedure No. ERD SOP-3.1	Revision Number 6	Page 4 of 9
------------------------------	----------------------	-------------

- 6.2.5 Compare the new measurement to last month's water level as displayed on the Water-Level Measurement Field Sheet (Attachment A) and to previous water-level measurements written in the Well Entry Logbook.
- 6.2.6 Record measurement, date, and any notes next to last month's water level on the Water-Level Measurement Field Sheet (Attachment A). If the water-level measurement seems suspect or if there is a 0.5 ft difference from the last reading, then re-check water-level measurement. Place a check mark next to the well ID on the Water-Level Measurement Field Sheet to indicate that the measurement was verified.
- 6.2.7 Record measurement in the Well Entry Logbook and replace logbook in well.
- 6.2.8 Replace well cap and lock the protective casing and/or replace Christy Box lid.

6.3 Post Operation

- 6.3.1 Follow post operation activities described in SOP 4.1.
- 6.3.2 Store water-level indicator in a clean, protected area during transport to the next well and after work is completed.
- 6.3.3 Forward original Water-Level Measurement Field Sheet to DMT.

7.0 QA RECORDS

- 7.1 Well Entry Logbook
- 7.2 Water-Level Measurement Field Sheet

8.0 ATTACHMENTS

Attachment A—Example of Water-Level Measurement Field Sheet

Attachment B—Equipment Checklist

Procedure No. ERD SOP-3.1	Revision Number 6	Page 5 of 9
------------------------------	----------------------	-------------

Attachment A

Example of Water-Level Measurement Field Sheet

Procedure No. ERD SOP-3.1	Revision Number 6	Page 6 of 9
------------------------------	----------------------	-------------

1-Apr-95

Water-level measurement field sheet.

Well designation	Depth to H ₂ O (TOSP)	Date H ₂ O level taken	H ₂ O elevation	Shiner elevation	Pom elevation	Top of fixed structure
K1-01C	105.30	Apr-95	970.78	1074.08	1076.08	2.00
K1-02B	39.36	Apr-95	1067.75	1105.11	1107.11	2.00
K1-03	142.00	Apr-95	965.93	1105.93	1107.93	2.00
K1-08	158.35	Apr-95	964.25	1120.58	1122.60	2.02
K2-01C	69.02	Apr-95	982.17	1049.19	1051.19	2.00
K2-03	55.57	Apr-95	1011.07	1064.64	1066.64	2.00
K2-04S	30.06	Apr-95	1061.89	1088.95	1091.95	3.00
K7-01	29.72	Apr-95	1289.30	1317.02	1319.02	2.00
K7-03	32.19	Apr-95	1306.90	1336.09	1339.09	3.00
K7-06	28.54	Apr-95	1385.41	1410.95	1413.95	3.00
K7-10	40.28	Apr-95	1303.03	1340.64	1343.31	2.67
K8-01	136.47	Apr-95	963.97	1098.44	1100.44	2.00
K9-01	80.62	Apr-95	994.89	1072.51	1075.51	3.00
NC2-06	54.44	Apr-95	979.07	1032.17	1033.51	1.34
NC2-08	67.02	Apr-95	985.65	1050.67	1052.67	2.00
NC2-10	68.68	Apr-95	972.03	1038.44	1040.71	2.27
NC2-11S	56.00	Apr-95	972.52	1025.52	1028.52	3.00
NC2-12S	54.97	Apr-95	973.55	1025.52	1028.52	3.00
NC2-13	48.24	Apr-95	973.26	1018.49	1021.50	3.01
NC2-14S	22.15	Apr-95	1052.79	1071.94	1074.94	3.00
NC2-19	114.78	Apr-95	977.61	1090.39	1092.39	2.00
NC2-21	38.62	Apr-95	963.52	999.14	1002.14	3.00
NC2-23	14.94	Apr-95	916.26	929.20	931.20	3.00
NC7-10	10.25	Apr-95	1216.05	1223.63	1226.30	2.67
NC7-11	20.70	Apr-95	1223.69	1241.72	1244.39	2.67
NC7-12	23.55	Apr-95	1262.14	1283.02	1285.69	2.67
NC7-17	NM	Apr-95	–	1385.76	1388.76	3.00
NC7-18	24.49	Apr-95	1307.77	1329.26	1332.26	3.00
NC7-19	22.36	Apr-95	1240.62	1260.98	1262.98	2.00
NC7-21	30.88	Apr-95	1273.26	1301.47	1304.14	2.67
NC7-24	DRY	Apr-95	–	1357.16	1359.83	2.67
NC7-28	41.07	Apr-95	1258.46	1297.53	1299.53	2.00
NC7-29	54.26	Apr-95	1200.48	1252.74	1254.74	2.00

Procedure No. ERD SOP-3.1	Revision Number 6	Page 7 of 9
------------------------------	----------------------	-------------

Water-level measurement field sheet. (Continued)

Well designation	Depth to H ₂ O (TOSP)	Date H ₂ O level taken	H ₂ O elevation	Shiner elevation	Pom elevation	Top of fixed structure
NC7-36	DRY	Apr-95	–	1358.37	1361.37	3.00
NC7-37	DRY	Apr-95	–	1336.05	1338.72	2.67
NC7-40	25.08	Apr-95	1294.70	1317.11	1319.78	2.67
NC7-44	35.37	Apr-95	1320.76	1354.13	1356.13	2.00
NC7-45	28.83	Apr-95	1154.02	1180.18	1182.85	2.67
NC7-46	22.81	Apr-95	1108.62	1128.76	1131.43	2.67
NC7-47	62.98	Apr-95	1205.53	1265.83	1268.51	2.68
NC7-48	NM	Apr-95	–	1381.40	1381.77	0.37
NC7-49A	NM	Apr-95	–	1383.91	1384.37	0.46
NC7-51	36.49	Apr-95	1311.64	1345.13	1348.13	3.00
NC7-52	76.31	Apr-95	1292.04	1366.35	1368.35	2.00
NC7-53	33.59	Apr-95	1389.73	1421.98	1423.32	1.34
NC7-54(*)	12.72	Apr-95	1194.53	1204.25	1207.25	3.00
NC7-56	23.25	Apr-95	1108.92	1126.86	1132.17	5.31
NC7-57	DRY	Apr-95	–	1101.49	1106.50	5.01
NC7-59	13.43	Apr-95	1102.33	1113.09	1115.76	2.67
NC7-61	48.38	Apr-95	1230.99	1276.70	1279.37	2.67
NC7-63	DRY	Apr-95	–	1346.70	1349.37	2.67
NC7-65	190.70	Apr-95	1260.58	1448.61	1451.28	2.67
NC7-68	35.33	Apr-95	1287.57	1320.23	1322.90	2.67
NC7-69	4.33	Apr-95	1246.13	1250.46	1250.46	1.76
NC7-70	35.14	Apr-95	1272.28	1304.75	1307.42	2.67
NC7-71	38.57	Apr-95	1264.65	1300.55	1303.22	2.67
NC7-72	32.64	Apr-95	1123.71	1153.68	1156.35	2.67
NC7-73	27.63	Apr-95	1138.64	1163.60	1166.27	2.67
NC7-76	23.86	Apr-95	1253.02	1274.21	1276.88	2.67
W-850-05	31.26	Apr-95	1272.13	1300.41	1303.39	2.98

Notes:

DRY = No water detected in well casing at time of measurement.

NM = Not measured.

– = No data to report.

TOSP = Top of stove pipe.

POM = Point of measurement.

* Check during rainy season—may see saturation.

Procedure No. ERD SOP-3.1	Revision Number 6	Page 8 of 9
------------------------------	----------------------	-------------

Attachment B

Equipment Checklist

Procedure No. ERD SOP-3.1	Revision Number 6	Page 9 of 9
------------------------------	----------------------	-------------

Equipment Checklist

- _____ Two-way radio
- _____ Water-level indicator (with extra batteries)
- _____ Indicator reference bar
- _____ De-ionized water
- _____ Squirt bottle
- _____ Disposable gloves
- _____ Tool kit
- _____ Snake chaps (if necessary)
- _____ Appropriate maps
- _____ Water-Level Measurement Field Sheet
- _____ Paper towels
- _____ Pencils, pens
- _____ Detergent soap
- _____ Bucket